The miracle of sugar production is the beet plant itself. The miracle by which the plant takes carbon dioxide out of the air, and water out of the soil and converts it into sugar is far more wonderful than the means by which man takes the beet roots and turns them into sugar. The sugar is manufactured in the leaves of the plant and is deposited in the roots for safe keeping. The carbon dioxide from the air enters the leaves through small openings or pores. The water is taken from the soil by the root hairs and carried up into the leaves. At first the beet plant uses the sugar to promote its own growth. When this is accomplished it deposits the sugar in the root. Toward the last this sugar is deposited very rapidly.

Would it be possible ever to dispense with the plants themselves and make sugar by simply putting together the carbon dioxide and water? Chemists have already given thought to this. Said W. W. Robbins, a Colorado sugar man:

"Will man ever be able to duplicate the processes in the green cells of living plants, and manufacture sugar from carbon dioxide and water, with the aid of sunlight as energy? We should not be too ready to answer 'No.' The process is the subject of painstaking investigation. It is a chemical process, certain elements of which are partially understood. But, even should he be able in an experimental way to carry on these processes, it is a long step to the manufacture of the product on a commercial scale as cheaply as the sugar beet can do it."

Very early in the sugar beet season representatives of the various sugar factories go out and make contracts with the growers, usually for a certain acreage, for which a stipulated price will be paid. The companies agree to furnish the seed at a stipulated price, and the grower agrees to care for his beets under the direction of the company and to deliver them to the company. This patronage of the company is a unique feature of the sugar beet business. Not only does it tell the grower just how to do it and keep numerous field men out all the time, but it tells the grower just what he will get. It will easily be seen that the business of raising sugar beets thereby differs from almost any other crop. It is not like wheat, where the grower looks after everything himself and takes what the market offers. The beet grower has a pretty fair idea as to just where he stands, and it is not without advantages to him.

However, there has been an increasing agitation among growers for a price of beets based on that of sugar. That is, the more the company receives for sugar the more the grower would be paid for his beets. Back in 1903 the growers received $4.50 a ton for their beets. A little more than a year ago it went as high as $12, in the case of the largest sugar company, with a bonus in event the price of sugar went up. But sugar came down instead. In 1921 contracts are being made on a flat basis of $7, or $6 plus a bonus, provided the price of sugar moves upward. In the case of some companies, growers also have had a sliding scale which provided for a bonus when the beets were unusually productive of sugar. This has not been popular in many sections, however, since some growers never could understand why one man's beets might have a large percentage of sugar, while theirs, just across the road, would fall down on the amount of sugar contained.

The sugar beet business is a busy industry. It is a great occupation for hand labor, and early in the season contracts are made with laborers for the season. The exodus of the Russians from the various towns in the Mississippi Valley to the beet fields is an annual occurrence. Quite a large number of Mexicans also have been utilized during the labor shortage of the last few years. These laborers are usually hired by families, each family agreeing to take care of a certain acreage up through harvest time. During the boom year of 1920 contracts were made on a basis of as high as $35 an acre. It will be seen that a family—the women as well as the children work during the summer months in the beet fields—could make a very tidy sum if they tended 80 or 90 acres. In fact, family incomes of $2,000 to $3,000 for the summer's work were common among these Russians a year or so ago. Usually about 10 acres of beets are allotted to the care of each person.

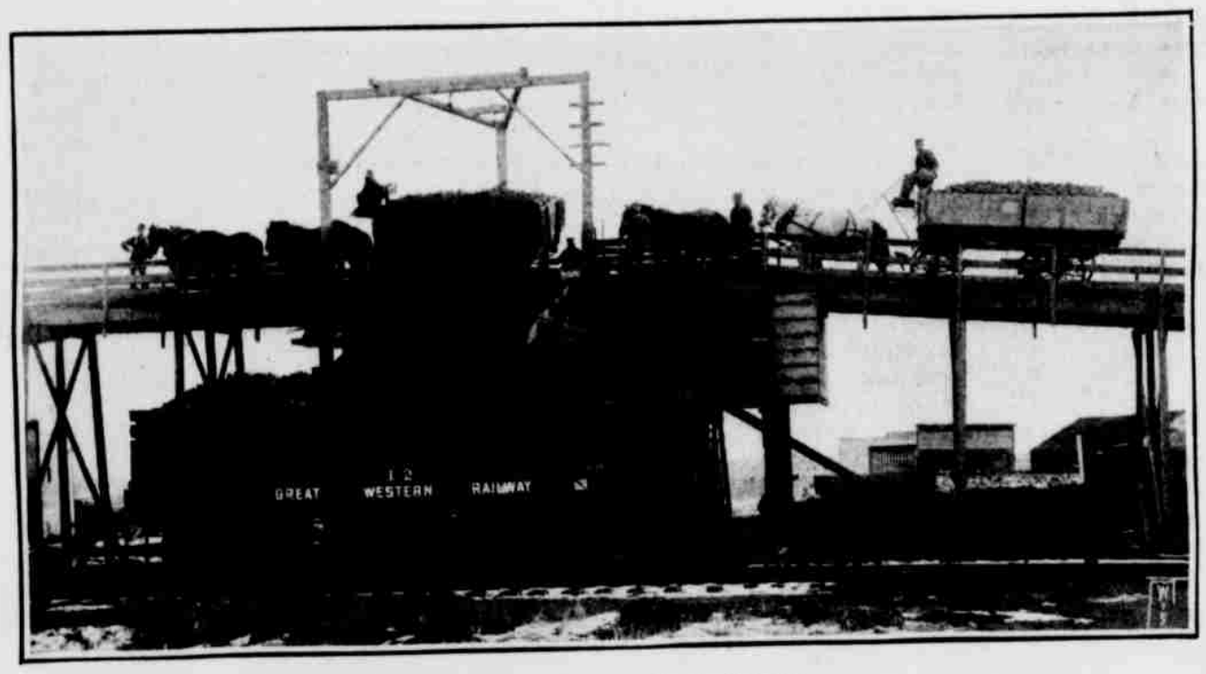
The beet seed is not usually sown until the soil is warm enough to produce a quick germination, this, of course, depending on the section of the country where the beets are being grown and on the particular season. The seed is planted from one-half to one and one-half inches deep, depending on the soil. Usually about 15 pounds of seed per acre is used.

A rich field of sugar beets.

When the beets have started growing to advantage they are blocked and thinned. Blocking consists in cutting out with a hoe all the plants except a little clump every eight inches. Thinning consists in pulling up all except one stalwart beet in each clump. The contract laborers get a real taste of work here, since most of it is done by hand. The beets also here get their first real hoeing.

The sugar company itself usually determines the time of harvesting by tests showing the sugar condition of the roots. If the crop had a perfect stand, it would mean 30,000 to 40,000 plants an acre. Supposing that each beet root weighed a pound, which is below the average, there would be 15 to 20 tons of beet roots an acre. I have known personally farmers who have obtained 20 tons to the acre, one farmer of my acquaintance making $1,600 net profit on 18 acres of beets. He happened to be a homesteader who settled out in the irrigated country in Western Nebraska when it was first opened in 1909, and following the war boom cleaned up $7,500 net profit from his 80-acre farm in one year. But he was a real exception to the general rule.

There are several operations to the harvesting of beets where the contract labor finds plenty to do. The beets are first loosened from the soil by a plow-like implement. Following this implement the laborers go along and pull up the beets. Then comes along another set of laborers who top the beets with a sharp knife, severing the foliage from the root. The roots are then thrown in piles, from which they are ready to be hauled to the factory.



Delivering the crop at the beet dump.

The uninitiated person going through the sugar factory is easily mystified at the maze of pipes, boilers and tanks. In fact, it takes a number of excursions before one really understands the operation. From the time the beets enter the factory until the sugar is packed in bags, human hands never touch the product. The beets are carried into the sugar factory by a stream of water which washes them at the same time. They are then elevated to the top of the building. The bad pieces and foreign material are picked out and then they pass into a machine which cuts them into small strips called cossettes. These strips of beet are then placed in huge diffusion batteries, which are filled with hot water. Water is passed through these batteries successively until all the sugar has been extracted. The beet pulp is then ready to be sold for stock feed.

After being subjected to numerous purifications and filterings, the liquid is ready to be evaporated. After passing through a number of evaporators and having been filtered again, it is boiled in vacuum pans to grain it. There is real art in sugar boiling here, for the object is to form a grain so as to have just as little sirup as possible left. From here the sugary sirup goes into the centrifugals, where the remaining sirup is driven off. The sugar is then dried and is ready to be sacked. When the sugar comes from the factory it is ready for the table.

Many persons have the idea that cane, beet, and maple sugar are different things. But sugar is all the same, maple sugar owing its taste to its impurities. Many housewives in America formerly had the idea that beet sugar would not produce good jellies, just as housewives in England and on the continent had the same idea of cane sugar. But careful analysis on the part of the United States Bureau of Chemistry brings the opinion that "where the highest grades of commercial granulated sugars are used, there is no choice between beet and cane sugar. It is practically impossible to distinguish cane sugar from beet sugar, especially in the case of high grade sugars."

Will the United States ever be able to grow all its own sugar? There are some sugar men who declare this a possibility. But the rate of consumption keeps increasing along with the increase in production. However, it is interesting to note that back in 1894, but 13.3 per cent of the total amount of sugar consumed here came from the continental United States. Now the percentage produced here represents close to 25 per cent of the total consumption, and a further increase is not unlikely.

Our Bill for Everyday Goods

HAVE you any idea how many millions of dollars American manufacturers collect from the public in the course of a year for everyday articles such as candy, cheese, collars, baking powder, suspenders and garters, chewing gum, corsets, shirts, grindstones, baby carriages, cigarets, pocketbooks, pickles and various other items?

You will be amazed when you read the following authentic figures as compiled by the United States Census Bureau. Inasmuch as practically all men are now using tobacco, either in the form of cigarets, cigars, snuff, pipe-smoking or chewing, suppose we start out with the nation's annual tobacco bill as represented by the amount of money received by the manufacturers —the profits added by the wholesalers and retailers would, of course, make the totals decidedly higher. The value of cigarets and cigars produced during the year 1919 was $368,159,000; chewing and smoking tobacco and snuff, $238,820,000; pipes of all kinds, $11,554,000, and cigar boxes $32,293,000, making a grand total of $650,826,000. Our tobacco bill for 1919 was more than 26 times as much as were the expenses of the Federal Government in 1840, when Martin Van Buren was the Chief Executive of the country.

The value of candy and ice cream produced annually by the factories throughout the country is $637,215,000, almost twice as much as was required to operate all branches of the government in 1875.

The hot, bothersome bandages, known as collars, that men are obliged to wear around their necks, cost $47,572,000. Add to this amount the retailers' profit and the weekly laundry toll, and you will have some staggering figures. Shirt factories are kept humming sufficiently to produce $210,295,000 worth of that article of male adornment.

According to Uncle Sam's latest count, America produced $51,240,000 worth of chewing gum in the short space of 12 months.

A great many persons have been under the impression that the use of corsets has been slowing up a bit in recent years. But according to government statistics there are more corseted figures now than several years ago. In 1914 the factories made $40,551,000 worth of them, whereas in 1919 it increased to $75,542,000.

Despite the seemingly general prevalence of home brew and sly stills, the use of soft drinks is increasing at a rapid pace. In 1914 only $58,401,000 worth of mineral and soda waters were produced; in 1919 it jumped to $130,673,000.

As eaters of cheese the American people are going strong. In 1919 we made $143,708,000 worth of it.

It takes $24,508,000 each year to keep the blessed kiddies in baby carriages and sleds.

It might be mentioned that our grandparents never heard of such stuff as condensed milk. Nevertheless, in 1919 their grandchildren used $339,570,000 worth.

Who on earth would ever dream that suspenders and garters would relieve the wearers of such a stupendous sum annually as $58,884,000? In other words, we are now paying out yearly more than three times as much for suspenders and garters as Congress appropriated for the running of the Department of Agriculture during the first year of Woodrow Wilson's régime.

Since it has become the custom of the fair sex of America to reconstruct their complexions each morning, powder their noses hourly, redden their lips as may be necessary, and profusely sprinkle their handkerchiefs and gorgette blouses with fetching perfumery, it has been necessary to build many new factories throughout the land to supply the demand for such articles. There are now 568 such manufacturing establishments, which produce $59,592,000 worth of the brilliant-appearing and good-smelling stuff every year.